REMARKS

Applicants respectfully request reconsideration and allowance of the pending claims.

I. **Status of the Claims**

Upon entry of this amendment, claims 48, 52, 53, 59, and 67-71 remain pending. Claims 72-79 are new. Claim 48 has been amended. Support for the amendments to claim 48 may be found in applicants' published application at paragraphs [0027], [0036], and [0051]-[0052]. New claims 72-79 are supported by paragraphs [0031]-[0032].

II. **Claim Rejections Under 35 U.S.C. §112, first paragraph**

Reconsideration is requested of the rejection of claims 70 and 71 as failing to comply with the written description requirement. These claims have been amended to clarify that the concentrations are starting concentrations. Applicants respectfully request that the rejections be withdrawn.

III. **Claim Rejections Under 35 U.S.C. §103(a)**

A. Harbulak et al. in view of Gulla et al. and Parker et al.

Reconsideration is requested of the rejection of claims 48, 52, 53, 59, 61, and 68-71 as being obvious over Harbulak et al. (U.S. 4,486,711) in view of Gulla et al. (U.S. 4,152,164) and Parker et al. (U.S. 3,887,732).

Claim 48 is directed to a method for electroless deposition of a nickel-phosphorus layer with internal compressive stress on substrates, the method comprising:

contacting the substrates with an electrolyte consisting essentially of:

nickel acetate,

> a hypophosphite reducing agent,
>
> a complexing agent ***comprising 2-hydroxypropanoic acid and propanedioic acid***,
>
> an accelerator,
>
> a stabilizer, and
>
> optionally other components selected from the group consisting of phosphorus, additional metals, and finely divided particles;
>
> to thereby electrolessly deposit the nickel-phosphorus layer with internal compressive stress on the substrates, wherein ***the nickel-phosphorus layer comprises between 2 to 7% phosphorus,*** the nickel-phosphorus layer is electrolessly deposited on said substrates at a deposition rate of 7 µm/h to 14 µm/h , and the nickel-phosphorus layer ***is deposited with internal compressive stress*** throughout a throughput of 14 to 22 MTO;
>
> wherein the throughput is between 70 g/L nickel and 110 g/L nickel; ...

Among the features of the claim is the combination of 2-hydroxypropanoic acid and propanedioic acid, which is not disclosed in any of the cited references. Moreover, the method requires deposition of a nickel-phosphorus layer wherein the phosphorus content is between 2 to 7% and the nickel layer is deposited with internal compressive stress. That is, the as-deposited nickel layer has internal compressive stress, which is not disclosed in the prior art, nor would it have been obvious in view of the cited combination of references.

Harbulak et al. disclose an electroless nickel plating bath and method. As stated in Col. 4, lines 30-50, the nickel ions may be introduced into the bath using sources such as nickel sulfate, nickel chloride, and nickel acetate and the reducing agent may be hypophosphite. The concentration of nickel ions may vary from 1 to 15 g/L, 3 to 9 g/L, or the preferred concentration range from 5 to 8 g/L.

Starting at Col. 4, line 50 and ending at Col. 5, line 20, Harbulak et al. disclose complexing agents, including glycolic acid, lactic acid, malic acid, glycine, citric acid, acetic acid, tartaric acid, and succinic acid. Harbulak et al. fail to disclose a complexing agent comprising both lactic acid and propanedioic acid. None of the other references disclose the combination of lactic acid and propanedioic acid.

Harbulak et al.'s Example 3 is described starting at Col. 9, line 30. Harbulak et al. state that:

> The bath was periodically replenished to maintain the nickel and hypophosphite ion concentration substantially constant for more than 8 bath turnovers. A bath "turnover" or bath cycle is defined as a plating duration when all of the original nickel metal content in the bath has been consumed and has been replenished by subsequent additions.

The Office has concluded that Harbulak et al.'s statement regarding "more than 8 bath turnovers" means that they provided "no upper limit on the amount of turnovers." Why did Harbulak et al. limit themselves to 8? Why didn't Harbulak et al. state that they held the nickel and hypophosphite ion concentrations constant for more than 10 turnovers, or 12, or 14, or 18, or 22? Because of other disclosures immediately following this statement, such as the below:

> Generally, the useful operating life of electroless nickel plating baths in accordance with prior art practice ranges ***from about 6 to about 10 turnovers before the bath must be discarded.***

Moreover, the empirical results shown in Table 3 that the highest number of turnovers achieved was 8.1. 8.1 qualifies as "more than 8" and implies something far different from "no upper limit." In view thereof, Harbulak et al. fail to disclose the claim requirement of 14 to 22 MTO.

Applicants particularly request thoughtful reconsideration of the Office's position that Harbulak et al. encompass unlimited turnovers, or even significantly more than 8 turnovers. It is clear that one skilled in the art would see this "more than 8" statement as a laudatory statement meant to approximate the most favorable results achieved. A good bowler with a 256 average describes her average as "more than 250," not as "more than 100." A golfer who shoots 78 and 79 consistently says that he "breaks 80"; he doesn't say that he "breaks 100." To take "more than 8" here to mean they achieved, e.g., 16 turnovers would require taking the statement completely out of context. Applicants therefore respectfully submit that the statement "more than 8" here cannot fairly be deemed to suggest achievement of the claim requirement of 14 to 22 MTOs.

Moreover, the claimed method is not merely directed to a method for depositing nickel through 14 to 22 MTO. The claimed method also requires that the nickel concentration deposited is between 70 and 110 g/L. To meet this claim requirement, the Office has unfairly and inappropriately selected and combined disclosures from Harbulak et al. that bear no relevance to each other. In this regard, the Office has combined the Col. 4 disclosure of nickel concentrations from 1 to 15 g/L with the 8 MTO achieved in Example 3 to assert that Harbulak et al. disclose total nickel throughput ranging from 8 to 120 g/L. This selectivity conveniently ignores that the nickel concentration of the composition of Example 3 was only 6 g/L and that Harbulak et al. explicitly state that only 10 MTO may be achieved "before the bath must be discarded." At most, therefore, Harbulak et al. disclose that the maximum throughput of nickel that may be deposited is only 60 g/L, which falls well short of the minimum required by claim 48.

The Office's assertion that one may merely multiply the highest nickel concentration disclosed in Harbulak et al. by the suggested number of turnovers to arrive at a large absolute amount of nickel deposited is effectively rebutted by the cited Gulla et al. reference at Col. 2, lines 51-64:

> For example, when plating an active substrate such as aluminum with a nickel plating solution containing ***about seven or more grams of nickel as metal, solution by-products are a serious problem of the third or fourth plating cycle.*** For less active substrates, such as catalyzed plastic or non-active metals such as mild steel, by-products are a serious problem by about the 6th to 8th cycle. As a consequence, an electroless solution is frequently dumped after from about 3 to 10 plating cycles thus requiring shutdown of the plating line for preparation of fresh solution resulting in lost time and costs known to be associated with shutdowns and disposal of used solutions.

Gulla et al. clearly establish that higher nickel concentrations (which necessitate higher concentrations of other bath components) are inversely proportional to the number of MTOs achieved. Therefore, if one prepared a Harbulak et al. bath containing 15 g/L nickel with concomitantly high concentrations of hypophosphite, complexing agents, etc., one would assume that the MTO would be low, and vice versa, if the nickel concentration were only 1 g/L. Any assertion otherwise clearly ignores the experience of the ordinarily skilled person in the art, as disclosed by Gulla et al.

Gulla et al. has been cited for disclosing that the number of MTOs can be extended indefinitely by a method involving withdrawal of a portion of the plating solution and replenishment. Gulla et al.'s patent had issued 5 years prior to the filing date of Harbulak et al. and yet the ordinarily skilled person, as evidenced by Harbulak et al., had not yet extended the number of MTOs beyond 8, or maybe 10, even though Gulla et al.'s work was available. Gulla et al. is also a 30 year old patent, and as evidenced by applicants' Background, the MTO problem had not yet been solved even by the time of applicants' much later invention. See applicants' published application at paragraph [0008]:

> [0008] The lifespan of such electroless baths is thus limited, since the electrolyte can be used only for a certain number of coating runs with uniform coating results. The age of a bath is usually given in terms of metal turnover (MTO), where 1 MTO is equal to the amount of metal deposited from the bath. This corresponds to the originally introduced concentration of metal ions in the bath, in each case with respect to the total volume of the bath. In the case of the methods that are currently known in the prior art the degradation products in the electrolyte reach a concentration after 5 to 10 MTO that is so high that a high deposition rate as well as a uniformly high quality of the deposited metal can no longer be guaranteed. The electrolyte must then either be replaced or regenerated by means of appropriate agents.

Additionally, Gulla et al.'s disclosure is entirely theoretical in nature. Their method is based purely on mathematical calculations of the number of MTOs until an equilibrium concentration of nickel and other consumables, waste products, and replenishment reactants is achieved. Gulla et al. did not disclose any actual plating experiments to show that their method actually achieved "infinite operation." See Col. 5, line 62 and Col. 7, line 42: "The following formulation is set forth for purposes of illustration...."

Regardless of whether or not Gulla et al. achieved "infinite operation" which is, of course, impossible to verify, their method of extending MTOs is predicated upon allowing the concentration of non-consumable and waste products to build up to relatively high concentrations. See, for example, Col. 6, line 53, in which the equilibrium concentration of sulfate ions is stated to be 82.46 g/L. See also Col. 7, lines 1-2, which states that the waste product phosphite concentration may be 80.84 g/L at equilibrium, or at Col. 7, line 14, which states that the phosphite concentration may be 88.25 g/L. There is no evidence in Gulla et al. or any of the prior art of record that allowing the waste ion concentration to increase to such high levels results in a nickel layer having an internal compressive stress, much less that the internal compressive stress would be achieved through 14 to 22 MTO or 70 to 110 g/L of nickel throughput. Assuming that the Office's point is valid that internal compressive stress is not only desirable, but achievable through routine experimentation, it would be reasonable to conclude that Gulla et al. would have disclosed the stress properties of their nickel layer. They did not -- because (1) they provide no empirical evidence of any nickel layer actually deposited, and (2) if it were achievable, they would have stated as much, particularly since Parker et al., which issued before Gulla et al.'s filing date, was available to Gulla et al.

Not only does the method defined by claim 48 require complexing agents comprising both lactic acid and propanedioic acid (not disclosed in any of Harbulak et al., Gulla et al., or Parker et al.), metal turnovers between 14 to 22 (not disclosed in Harbulak et al. as evidenced by Gulla et al.), and a total nickel amount deposited from 70 to 110 g/L (not disclosed in Harbulak et al. as evidenced by Gulla et al.), the claimed method requires that the nickel deposited through all 14 to 22 MTO and the 70 to 110 g/L throughput range has an internal compressive stress in the as-deposited nickel layer. Harbulak et al. and Gulla et al. are both silent regarding the stress properties of their deposited layer.

To overcome this deficiency, the Office has selected Parker et al. for disclosing that nickel coatings with an internal compressive stress is not only desirable, but achievable through routine experimentation. Clearly, this assertion is the result of improper hindsight reasoning, since Parker et al. is the oldest reference cited, and neither Harbulak et al. nor Gulla et al. even disclose the stress properties of their nickel layers, much less that the nickel layers are characterized by internal compressive stress, and much less still that this is achievable through 14 to 22 MTO in the as-deposited nickel layer. In view thereof, there is no evidence in the prior art of record that Parker et al.'s disclosure is sufficient to make the achievement of a method in which a nickel layer is deposited with internal compressive stress through 14 to 22 MTO amenable through routine experimentation.

Parker et al. disclose that the stress properties of a nickel plated layer can be influenced by the phosphorus concentration of the nickel layer. Their plating composition is stated to contain nickel, hypophosphite, and lactic acid, among other components. Parker et al., like the other references currently of record, fail to disclose a complexing agent that is both lactic acid and propanedioic acid.

Parker et al. show that compressive stress can be achieved, but only if the phosphorus content of the nickel layer is near the upper end of a range from 3 to 13 percent. At phosphorus concentrations near the low end of the range of 3 to 13 percent, the nickel layer is characterized by tensile stress. See claim 1, which states:

> 1. A method of producing a nickel-phosphorus alloy coating having a predetermined and controlled residual stress in the range of from about +15 ksi tensile stress to about -17 ksi compressive stress therein and chemically deposited on a metal substrate ... to deposit on the metal substrate a nickel-phosphorus coating having ***a phosphorus content of a predetermined value in the range of between about 13 percent and about 3 percent***, maintenance of the pH of the bath at the upper end of ***the pH range coupled with maintenance of the temperature of the bath at the lower end of the temperature range producing a coating having a phosphorus content at the lower end of the phosphorus range*** and maintenance of the pH of the bath at the lower end of the pH range coupled with maintenance of the temperature of the bath near the upper end of the temperature range producing a coating having a phosphorus content at the upper end of the phosphorus range, ***a coating having a phosphorus content near the lower end of the phosphorus range tending to be in tensile stress*** and a coating having a phosphorus content near the upper end of the phosphorus range tending to be in compressive stress, contacting the metal substrate with the bath for a time period sufficient to deposit on the metal substrate a coating having a predetermined thickness of at least about one-tenth mil, removing the coated metal substrate from the bath and cooling the coated metal substrate to ambient temperatures, whereby to produce a metal substrate having chemically deposited thereon a nickel-phosphorus coating having a predetermined and controlled residual stress therein.

Parker et al. therefore provide conditions of depositing a nickel-phosphorus layer having a low phosphorus content, but state that these nickel layers are characterized by tensile stress. The method defined by claim 48 limits the phosphorus content to between 2 and 7%, which, is at the lower end of Parker et al.'s phosphorus content range and which, according to Parker et al.'s method, results in a nickel layer characterized by tensile stress, not compressive stress, which is applicants' invention. Moreover, applicants' claim requires the compressive stress be achieved in an as-deposited nickel layer having phosphorus content from 2 to 7% through 14 to 22 MTO. That is, the compressive stress is present in the nickel layer as deposited and prior to annealing, which is a required process step of Parker et al.'s method toward reliably achieving internal compressive stress. That is, without annealing, the majority of Parker et al.'s nickel layers are not characterized by internal compressive stress unless the phosphorus content is very high. There is further no evidence in Parker et al.'s disclosure and figures that show the stress properties of their as-deposited nickel layer are achievable through the required 14 to 22 MTO. In this regard, applicants refer the Office to the §1.132 Declaration of Inventor Franz-Josef Stark, submitted with the Office with Amendment H on May 12, 2008, which shows that compressive stress can sometimes be achieved in conventional solutions through a certain low number of MTOs, but none of the conventional compositions tested can achieve compressive stress through 14 to 22 MTO.

Since the prior art has entirely failed to disclose any method of an electroless nickel plating method that can achieve an as-deposited nickel layer characterized by internal compressive stress through 14 to 22 MTO, it should be apparent that the applicants' achievement was the result of inventive insight, and not just routine experimentation. Yet, the Office insists that achieving this method is the result of only routine experimentation. How can this assertion be anything but the result of hindsight? If Parker et al. disclose that internal compressive stress is desirable and if achieving this goal is the result of mere routine experimentation, how can it be that after more than 30 years of experimentation as evidenced by the cited references, no one, prior to the present applicants, had performed such a method?

Applicants respectfully submit that the claimed method is the result of inventive contribution and respectfully request that the rejection be withdrawn.

B. Harbulak et al. in view of Gulla et al., Parker et al., and GB 2231063

Reconsideration is requested of the rejection of claim 67 as being obvious over Harbulak et al. (U.S. 4,486,711) in view of Gulla et al. (U.S. 4,152,164), Parker et al. (U.S. 3,887,732), and GB 2231063.

GB 2231063 does not correct any of the deficiencies of the other cited references. For example, GB 2231063 does not disclose the complexing agent that comprises both lactic acid and propanedioic acid. With regard to metal turnovers, the GB 2231063 inventors disclose that their process is limited to 5 MTO. See page 9, line 1. Additionally, GB 2231063 is entirely silent regarding the stress properties of their nickel layer, much less that the nickel layer is deposited having an internal compressive stress. GB 2231063 therefore does not disclose any method for depositing a nickel layer having internal compressive stress through 14 to 22 MTO and 70 to 100 g/L of nickel throughput or provide any guidance whatsoever that would have caused the ordinarily skilled person to conclude that such a method can be achieved through routine experimentation.

In view of the foregoing, the claims are patentable over the four-reference rejection, and the rejection should be withdrawn.

C. Harbulak et al. in view of GB 1243134 and Parker et al.

Reconsideration is requested of the rejection of claims 48, 52, 53, 59, 61, and 68-71 as being obvious over Harbulak et al. (U.S. 4,486,711) in view of GB 1243134 and Parker et al. (U.S. 3,887,732).

Applicants' method as defined by claim 1 is directed to the electroless deposition of nickel layers having internal compressive stress. By selecting the various parameters in the especially preferred embodiment now manifested in amended claim 48, applicants are able to achieve this at 1 MTO, at 2 MTO, at 3 MTO, and so on through at least 14 MTO, 15 MTO, 16 MTO, 17 MTO, or more, up to 22 MTO. See paragraphs [0020] and [0036]. The nickel layer is deposited having internal compressive stress, which is characterized by a stress that results in internal compaction (decrease in volume), thereby leading to a nickel layer that is pore-free and crack-free. See applicants' specification at paragraph [0020]. This is in sharp contrast to a metal layer having tensile stress, which is a force that causes elongation, or an increase in volume. Not all metal layers have a compressive stress. As amended, the complexing agent of the plating composition is the combination of 2-hydroxypropaneoic acid and propanedioic acid. Neither of these is glutamic acid.

Generally speaking, therefore, applicants' invention as manifested in claim 48 provides a nickel-phosphorus coating which has internal compressive stresses to promote pore- and crack-free coating, and it is deposited at a high throughput rate with long bath life measured in MTOs. The problems with prior processes are documented in applicants' paragraphs [0001] through [0012]; and the achievement of the invention is stated succinctly in [0013]:

> The invention is based on the task of specifying an electrolyte for electroless deposition of metals, from which uniform, pore-free and crack-free metal-phosphorus coatings with constant layer properties and high phosphorus contents can be deposited at an elevated deposition rate over a long period of time.

The Office asserts the invention is obvious essentially because a) Harbulak et al. teach a nickel-based process having certain of the characteristics of claim 48, b) GB '134 teaches 15-20 MTOs, and c) Parker et al. suggest internal compressive stresses.

With regard to the MTOs, Harbulak et al. achieved just 6.4, 7.8, and 8.1 turnovers with their process (Table 3).[1] GB '134 teaches how to achieve 15-20 MTOs with *its* process. Combining the two references, the Office then asserts that since the GB '134 process achieves 15-20 MTOs, it would have been obvious and simple optimization to get 14-22 MTOs from Harbulak et al.'s process:

> As to the exact number of throughputs provided by the bath, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Harubulak to optimize the amount of turnovers that can be provided as suggested by '134 to provide a desirable reuse of the bath, as Harbulak teaches that more than 8 turnovers can be provided, and does not provide an upper limit, and '134 teaches that a desirable range of metal turnovers when plating nickel with an electroless bath that includes a nickel metal base salt, reducing agent, complexing agent, accelerator and stabilizer is 15-20 times and therefore, since, as discussed in MPEP 2144.05, "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." [Office action, page 21]

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[1] The Office gratuitously characterizes this as "more than 8 MTOs." This is misleading, because in fact the maximum turnovers Harbulak et al. achieved was 8.1.

Continuing over page 22, the Office concludes

> ...it would have been obvious to optimize the turnover amounts, which are shown to be a result-effective variable by Harbulak et al.[2] and GB '134. [Office action, page 10.]

Section 2144.05 of the MPEP, upon which the Office relies here, goes on to state in subsection II B:

> A particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977)(The claimed wastewater treatment device had a tank volume to contractor area of 0.12 gal./sq. ft. The prior art did not recognize that treatment capacity is a function of the tank volume to contractor ratio, and therefore the parameter optimized was not recognized in the art to be a result-effective variable.) See also *In re Boesch*, 617 F2d 272, 205 USPQ 215 (CCPA 1980)(prior art suggested proportional balancing to achieve desired results in the formation of an alloy.)

As explained above, Harbulak et al. explicitly state that the MTO can only range from 6 to 10 before the bath must be discarded and their only empirical evidence of MTO topped out at a maximum of 8.1 MTOs before bath decomposition. The Office proposes on page 21-22 of the Office action that this person of ordinary skill would see from the GB '134 reference that 15-20 MTOs can be achieved, and then proceed to "optimize the turnover amounts." But just how would this person do so? GB'134, upon which the Office relies for teaching that MTOs can be increased, gives specific guidance:

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[2] Applicants respectfully disagree that Harbulak et al. show MTOs to be result-effective. Harbulak et al. provide no discussion whatsoever as to what factors affect MTO. But it is a moot question because GB '134 does appear to show that MTOs can be increased by using glutamic acid-based complexing agents.

> In practice, using a conventional electroless nickel plating bath consisting of an aqueous solution of a soluble salt such as nickel sulfate hexahydrate and a soluble hypophosphite such as sodium hypophosphite monohydrate, the phosphite concentration resulting from the oxidation of the hypophosphite ions continues to build up until the threshold of nickel phosphite solubility is reached at which time precipitation will occur. This phenomenon has been a major problem in connection with the use of electroless nickel plating baths inasmuch as precipitation of nickel phosphite leads to spontaneous decomposition of the bath around the initially formed precipitate. [GB '134; page 1, lines 30-45.]

> In accordance with the present invention, it has now been found that effective control of the formation and precipitation of nickel phosphite in electroless nickel plating may be achieved through the use of a bath comprising an aqueous solution of a water soluble nickel salt, a water soluble hypophosphite and glutamic acid or a water soluble salt thereof. ***It has been found that glutamic acid and its water soluble salts are highly effective chelating or complexing agents in electroless nickel plating baths and impart superior stability without deleteriously affecting the rate of nickel deposition.*** (emphasis added_[GB '134; page 2, lines 25-45.]

One skilled in the art seeking to increase MTOs from Harbulak et al.'s 8.1 maximum to GB '134's 15-20, therefore, could *only* deduce that to do so, he or she must use "glutamic acid and its water soluble salts" in the baths because they "prevent or substantially minimize the formation and precipitation of nickel phosphite and [such baths] may be operated for more extended periods of time than available prior art baths without decomposition." There is no suggestion in

GB'134 as to how to achieve 15-20 MTOs from a bath which uses, as the complexing agent both 2-hydroxypropanoic acid and propanedioic acid and does not contain glutamic acid.

Other than glutamic acid, the only teaching in any of the references before the Office of how to achieve applicants' 14 to 22 MTOs is in applicants' specification; i.e., the teaching to perform the very specific method of applicants' invention, which is manifested in the express requirements of the preferred embodiment of claim 48. Accordingly, 1) this overall combination of requirements is not disclosed or suggested by Harbulak et al. as admitted in the Office action; 2) the GB'134 reference provides *emphatic* reasons why one seeking to modify Harbulak et al.'s process to increase its MTOs should use glutamic acid as the complexing agent; and 3) the GB'134 reference provides *absolutely no reason* to modify Harbulak et al. to satisfy the specific requirements of claim 48. Applicants therefore respectfully submit that the cited art shows MTO to be result-effective and optimizable only by incorporating glutamic acid; which necessarily and specifically leads to a bath which lacks the express requirements of claim 48.

Similarly, neither Harbulak et al. nor GB '134 state that their processes deposit a nickel layer having internal compressive stress. Parker et al. teach how to achieve internal compressive stresses with *their* process, but not with Harbulak et al.'s process. Yet the Office is asserting essentially that since Parker et al. teach how to obtain internal compressive stresses with the Parker process, it would have been obvious how to obtain internal compressive stresses with the GB'134-modified Harbulak et al. process:

> It further would have been obvious to modify Harbulak in view of '134 to control bath conditions to apply the nickel plating with internal compressive stress as suggested by Parker in order to provide desirable increase in adhesion to the substrate, as Harbulak in view of '134 teach to provide nickel electroless plating with phosphorous, and Parker teaches that when providing nickel plating with phosphorous, the plating can desirably be performed to provide compressive stress in the plating so that increased adhesion to the substrate is provided. [Office action, page 22]

As explained above, Parker et al. determined that internal stress is result-effective based on phosphorus content and coating thickness, and further that higher phosphorus contents are necessary for internal compressive stress, but lower phosphorus contents, such as in the claimed range of 2 to 7% tend to deposit coatings having tensile stress.

Applicants have discovered, contrary to the expectations of Parker et al., a method that achieves deposition of nickel layer having internal compressive stresses throughout an extended bath life of 14 to 22 MTO. Accordingly, 1) this overall combination of requirements is not disclosed or suggested by GB'134-modified Harbulak et al. and 2) Parker et al. disclose that higher P contents are necessary for achieving internal compressive stress, and 3) none of the references, including Parker et al., disclose that internal compressive stress can be achieved in the as-deposited nickel layer through 14 to 22 MTO and a throughput of 70-110 g/L nickel. Applicants therefore respectfully submit that the cited art shows internal compressive stress to be result-effective and optimizable only by high phosphorus content in the nickel layer; which does not lead to a bath having the express requirements of claim 48.

Claim 48 is therefore patentable because

a) As admitted the Office action, Harbulak et al. do not disclose myriad claimed requirements or process conditions, including, among others, i) deposition rate, ii) nickel concentration, iii) throughputs/MTOs, iv) self-regulating pH, and v) internal compressive stress in the as deposited layer through an extended number of MTOs;

b) No reference discloses the complexing agent combination; and

c) modifying the Harbulak et al. process according to the teachings of the cited GB'134 and Parker et al. references does not lead one to a process having all the express requirements of claim 1.

The other pending claims are patentable for these same reasons and by virtue of the other elements they require. For example, none teach the narrow requirements of the especially preferred embodiments of claims 70 and 71.

D. Harbulak et al. in view of GB 1243134, Parker et al., and GB 2231063

Reconsideration is requested of the rejection of claim 67 as being obvious over Harbulak et al. (U.S. 4,486,711) in view of GB 1243134, Parker et al. (U.S. 3,887,732), and GB 2231063.

GB 2231063 does not correct any of the deficiencies of the other cited references. For example, GB 2231063 does not disclose the complexing agent that comprises both lactic acid and propanedioic acid. With regard to metal turnovers, GB 2231063 disclose that their process is limited to 5 MTO. See page 9, line 1. Additionally, GB 2231063 is entirely silent regarding the stress properties of their nickel layer, much less that the nickel layer is deposited having an internal compressive stress. GB 2231063 therefore does not disclose how to deposit a nickel layer having internal compressive stress through 14 to 22 MTO and 70 to 100 g/L of nickel throughput or provide any guidance whatsoever that would have caused the ordinarily skilled person to conclude that such a method can be achieved through routine experimentation.

In view of the foregoing, the claims are patentable over the 4-reference rejection, and the rejection should be withdrawn.

CONCLUSION

The Commissioner is hereby authorized to charge the fee for an extension of time up to and including September 14, 2009, and any other fees in connection with this response, to Deposit Account No. 19-1345.

Respectfully submitted,

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